

S/N 10/620,192

Response to Office Action Dated: June 4, 2007

Date: July 31, 2007

Listing of the Claims:

1. (Currently Amended) A non-oriented optical character recognition apparatus for use in locating and reading markings on a silicon wafer moving along a path of travel, the apparatus comprising:

a camera positioned along the path of travel for taking a plurality of line images each of different portions of the wafer having an unknown orientation with respect to the camera across a substantial portion of the wafer in succession as the wafer moves along the path of travel;

an illumination device positioned along the path of travel for projecting at least two different types of illumination along the path of travel intersected by the wafer in the area that the line images are taken, the illumination device is adapted to change the type of illumination in a synchronous and repeating manner with the taking of the plurality of line images; and

a processor in electronic communication with the camera for separating the line images into at least two separate wafer images of different illumination, identifying the wafer marking on at least one of the at least two wafer images of different illumination, and reading the wafer mark.

2. (Cancelled)

3. (Cancelled)

4. (Previously Presented) The optical character recognition apparatus of claim 1 wherein the camera further comprises at least two individual cameras positioned adjacent one another and transverse to the path of travel, the cameras adapted to respectively take sequential and synchronous images with the changing type of illumination.

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5. (Original) The optical character recognition apparatus of claim 1 wherein the at least two different types of illumination include a bright field illumination, a dark field illumination, an incandescent illumination and LED illumination.

6. (Cancelled)

7. (Cancelled)

8. (Original) The optical character recognition apparatus of claim 1 wherein the processor includes a first computer software component that receives the line images from the camera.

9. (Original) The optical character recognition apparatus of claim 1 wherein the processor further comprises a second, third and fourth computer software component in electronic communication with the camera, illumination device and line path for monitoring the illumination device, movement of the path of travel and the rate of the path of travel respectively.

10. (Original) The optical character recognition apparatus of claim 9 wherein the second, third and fourth computer software components control the illumination device, movement of the line path of travel and the rate of the path of travel respectively.

11. (Original) The optical character recognition apparatus of claim 1 wherein the processor further comprises a fifth computer software component for locating an identifiable area wherein the wafer markings are located.

12. (Original) The optical character recognition apparatus of claim 11 wherein

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the fifth software component locates an edge of the wafer, an edge notch of the wafer, the center of the wafer, and the area containing the wafer markings.

13. (Original) The optical character recognition apparatus of claim 1 wherein the processor further comprises a sixth software component for reading the wafer mark.

14. (Currently Amended) A non-oriented optical character recognition apparatus for use in locating and reading markings on a silicon wafer moving along a path of travel, the apparatus comprising:

a camera positioned along the path of travel, the camera adapted to take a plurality of individual and sequential line images each of different portions of the wafer having an unknown orientation with respect to the camera in succession across substantially the entire silicon wafer surface as the wafer moves along the path of travel;

an illumination device positioned along the path of travel, the illumination device projects at least two different types of illumination that sequentially and repeatedly change to a different type of illumination in a synchronous manner with the taking of each of the sequential line images to produce a single interlaced image of the wafer surface; and

a processor in electronic communication with the camera and the illumination device adapted to separate the single interlaced wafer image into separate images having the same type of illumination, examine at least one of the separate images to locate the wafer markings and read the wafer markings.

15. (Currently Amended) A method of non-oriented optical character recognition for use in locating and reading markings on a silicon wafer traveling along a first path of travel, the method comprising:

generating a single interlaced image of a wafer having an unknown orientation through separately and sequentially taking a plurality of line images each of different portions of

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the wafer in rapid succession across substantially the entire surface of the wafer and synchronously and sequentially projecting alternating types of illumination in the area of the line image in a repeating manner producing the single interlaced wafer image of the sequential line images of alternating types of illumination;

locating an area on the wafer containing the wafer markings; and
reading the wafer markings to identify the wafer.

16. (Original) The method of claim 15 wherein the step of locating an area on the wafer containing the wafer markings further comprising the steps of separating the single wafer image into individual wafer images having the same illumination and examining at least one of the separated wafer images to locate an edge, a notch on the edge, and the approximate center of the wafer.

17. (Previously Presented) A method of non-oriented optical character recognition for use in locating and reading markings on a silicon wafer traveling along a first path of travel, the method comprising:

generating at least one wafer image comprising a plurality of separately and sequentially taken line images of different portions of the wafer across a substantial portion of the wafer as the wafer moves along the path of travel;

locating an area containing the wafer markings on the at least one wafer image; and
reading the wafer markings to identify the wafer.

18. (Cancelled)

19. (Cancelled)

20. (Currently Amended) The method of claim 17 wherein the step of locating

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an area containing the wafer markings further comprising examining the at least one wafer image, locating a notch on the edge of the wafer, and locating the approximate center of the wafer.

21. (Original) The method of claim 17 further comprising the step of conducting a geometric transform of the area containing the wafer markings prior to reading the wafer markings to improve visibility of the markings.

22. (Previously Presented) The method of claim 25 further comprising examining each of the separated images and conducting a geometric transform on the area containing the wafer markings on each of the separated wafer images having different illumination and individually examining the transformed areas containing the wafer markings to determine if the wafer markings can be read on any one of the separated, transformed areas containing the wafer markings.

23. (Original) The method of claim 22 further comprising the step of combining at least two of the separated, differently illuminated and transformed areas containing the wafer markings to determine if the wafer markings can be read in the combined areas housing the markings.

24. (Previously Presented) The method of claim 17 further comprising the step of providing alternately and synchronously different types of illumination on the wafer for each line image taken.

25. (Previously Presented) The method of claim 24 further comprising the step of separating the sequentially taken line images into at least two wafer images each wafer image having the same type of illumination.

26. (Previously Presented) The method of claim 25 wherein the step of separating the sequentially taken line images occurs as the sequential line images are taken.

27. (Previously Presented) The method of claim 24 wherein the at least one wafer image comprises a single interlaced image of the sequential line images having different illumination.

28. (Previously Presented) The optical character recognition apparatus of claim 1 wherein a single interlaced image including the sequentially taken line images under alternating illumination type is generated prior to separation of the line images.

29. (Cancelled)

30. (Previously Presented) A non-oriented optical character recognition apparatus for use in locating and reading markings on a silicon wafer moving along a path of travel, the apparatus comprising:

an illumination device positioned along the path of travel adapted to alternately project at least two different types of illumination across the wafer in succession as the wafer moves along the path of travel,

an image recording device positioned along the path of travel adapted to take a plurality of sequential line images of the wafer synchronous with the alternating types of illumination; and

a processor in electronic communication with the image recording device adapted to separate the sequential line images having the same type of illumination and to identify and read the wafer markings.

31. (Previously Presented) The optical character recognition apparatus of

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claim 30 wherein the processor is adapted to generate a single interlaced image including the sequentially taken line images of alternating illumination.

32. (Previously Presented) The optical character recognition apparatus of claim 30 wherein the separation of the line images having the same illumination type occurs as the sequential line images are taken and produces at least two wafer images each image having the same illumination type.